

WHAT IS CLAIMED IS:

1. A vertical routing structure for a multi-layered substrate with a lamination structure, wherein the lamination structure has at least a through-hole linking the two surfaces of the lamination structure, the vertical routing structure comprising:

5                   a conductive rod positioned inside the through-hole and both ends of the conductive rod protruding above the two surfaces of the lamination structure respectively; and

                      a conductive layer formed between the interior sidewall of the through-hole and the conductive rod.

10                 2. The vertical routing structure of claim 1, wherein the multi-layered substrate furthermore comprises a first mask layer having at least a first opening on one surface of the lamination structure and a second mask layer having at least a second opening on another surface of the lamination structure such that the ends of the conductive rod not only fill up the first opening and the second opening but also protrude beyond the surfaces 15 of the first mask layer and the second mask layer respectively.

                      3. The vertical routing structure of claim 2, wherein the second opening has a diameter greater than the through-hole.

                      4. The vertical routing structure of claim 1, wherein one end of the conductive rods serves as a bump, a pre-solder block or a contact.

20                 5. The vertical routing structure of claim 1, wherein the structure furthermore comprises a bump attached to one end of the conductive rod.

                      6. The vertical routing structure of claim 1, wherein the structure furthermore comprises a pre-solder block attached to one end of the conductive rod.

7. The vertical routing structure of claim 1, wherein the structure furthermore comprises a solder ball attached to one end of the conductive rod.

8. The vertical routing structure of claim 1, wherein the lamination structure furthermore comprises at least a buried circuit layer that connects electrically with the  
5 conductive layer.

9. A method of fabricating a vertical routing structure inside a multi-layered substrate having a lamination structure therein, the method comprising the steps of:

(a) forming at least a through-hole in the lamination structure, wherein the through-hole passes through the lamination structure to link up the upper and lower  
10 surface of the lamination structure;

(b) forming a conductive layer on the interior sidewall of the through-hole;  
and

(c) filling the through-hole with a conductive material to form a conductive rod inside the through-hole such that the ends of the conductive rods protrude  
15 above the respective surfaces of the lamination structure, and the conductive layer is positioned between the interior sidewall of the through-hole and the conductive rod.

10. The method of claim 9, wherein before performing step (a), a first mask layer and a second mask layer are formed on the respective surfaces of the lamination structure, during step (a), the through-hole passes through the first mask layer and the second mask  
20 layer so that a first opening is formed in the first mask layer and a second opening is formed in the second mask layer, and during step (b), the conductive layer is formed inside the first opening and the second opening, and during step (c), the two ends of the conductive rods not only completely fill the first opening and the second opening but also

protrude beyond the surfaces of the first mask layer and the second mask layer respectively.

11. The method of claim 9, wherein before performing the step (a), a first mask layer and a patterned second mask layer are formed on the two surfaces of the lamination structure such that the second mask layer has a second opening, and during the step (a), the through-hole passes through the first mask layer and the second opening of the second mask layer so that a first opening is formed in the first mask layer, and during step (b), the conductive layer is formed inside the first opening and the second opening, and during step (c), the ends of the conductive rod not only fill up the first opening and the second opening respectively but also protrude beyond the surface of the first mask layer and the second mask layer respectively.

12. The method of claim 9, further comprising attaching a bump to one end of the conductive rod.

13. The method of claim 9, further comprising attaching a pre-solder block to one end of the conductive rod.

14. The method of claim 9, further comprising attaching a solder ball to one end of the conductive rod.

15. The method of claim 9, wherein the lamination structure furthermore comprises at least a buried circuit layer that connects electrically with the conductive layer.

16. The method of claim 9, wherein the step of filling the through hole with a conductive material in step (c) comprises performing a wave soldering, a spraying, a plating or an dipping operation.

17. A multi-layered substrate, at least comprising:

a lamination structure having at least a through-hole, wherein the through-hole passes through and links up with the surfaces of the lamination structure;

a first mask layer formed on one surface of the lamination structure,

wherein the first mask layer has at least a first opening;

5 a second mask layer formed on another surface of the lamination structure,

wherein the second mask layer has at least a second opening; and

a vertical routing structure comprising a conductive rod and a conductive layer, wherein the conductive rod occupies the interior of the through-hole and the ends of the conductive rod completely fill the first opening and the second opening

10 respectively, and the conductive layer occupies the space between the interior surface of the through-hole and the conductive rod.

18. The multi-layered substrate of claim 17, wherein the second opening has a diameter greater than the through-hole.

19. The multi-layered substrate of claim 17, wherein the conductive layer further 15 extends into the peripheral surface of the second opening of the second mask layer.

20. The multi-layered substrate of claim 17, wherein one end of the conductive rod serves as a bump, a pre-solder block or a contact.

21. The multi-layered substrate of claim 17, wherein the substrate furthermore comprises a bump attached to one end of the conductive rod.

20 22. The multi-layered substrate of claim 17, wherein the substrate furthermore comprises a pre-solder block attached to one end of the conductive rod.

23. The multi-layered substrate of claim 17, wherein the substrate furthermore comprises a solder ball attached to one end of the conductive rod.

24. The multi-layered substrate of claim 17, wherein the lamination structure furthermore comprises at least a buried circuit layer that connects electrically with the conductive layer.